CHNOLOGY DEPT.

INSTITUTE OF PETROLEUM REVIEW

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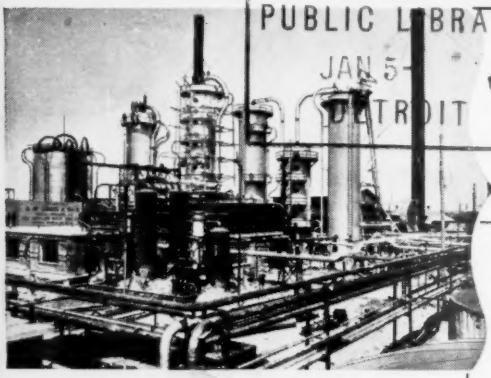

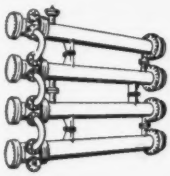

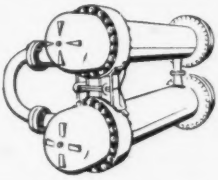

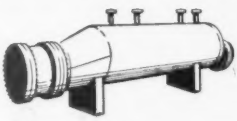

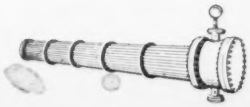

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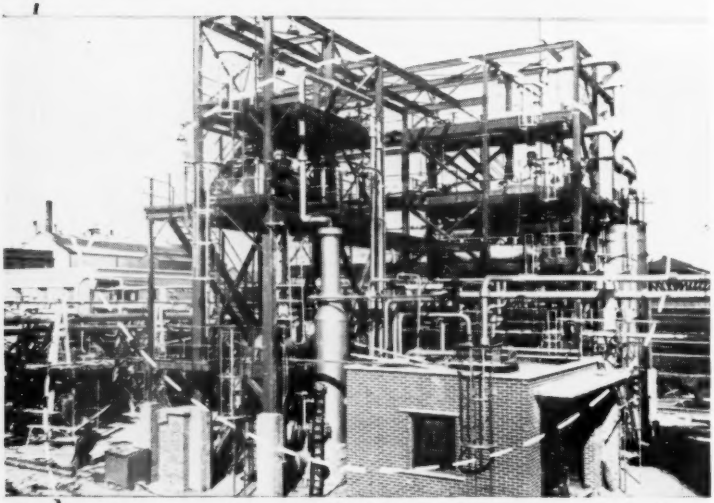

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Hon. Editor: F. H. Garner, O.B.E., Ph.D., F.R.I.C
Hon. Associate Editor: E. B. Evans, M.Sc., Ph.D. F.R.I.C.
Editor: George Sell

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THE IP REVIEW—A NEW FORMAT IN 1954

For the past seven years the *IP Review* has served its purpose of bringing news and views to its readers in spite of the handicap of a small size of page. This size of page was forced upon the Institute by the exigencies of war which caused all printing paper to be strictly rationed and available only in extremely small quantities. The main handicap of the small page size has been the inability to present reading matter and illustrations in the most attractive manner.

In recent months much attention has been given to the ways and means of remedying this defect and from the January 1954 issue the page size will be double that at present used and every endeavour will be made to maintain at least the same number of pages.

Coincident with the increase in page size of the *IP Review* the page of the *Journal* of the Institute is also to be enlarged to demy quarto (8½ × 11 inches), so that both publications will be of similar dimensions. For the first years of its existence the *Journal* was similar in size to this present *IP Review*, but in 1935 was changed to 6 × 9 inches. Now it falls into line with a large number of similar scientific journals. Steps are also being taken to ensure that the Journal is issued in the same month as it is dated instead of one month later as at present. Due, however, to the additional time needed for the preparation of annual indexes, this change will result in the January 1954 *Journal* being issued at least two weeks before the December 1953 number is available.

COUNCIL COMMENTARY

The meeting of Council which took place on 14 October was by far the most fully attended of recent months, although G. H. Coxon's absence due to illness was noted with regret. As usual, discussion was vigorous but well considered, the following being the "highlights" of the meeting.

ASLIB

The Institute has in the past been represented on the Association of Special Libraries and Information Bureaux by that indefatigable worker H. Hyams. He now finds that his commitments are so great that he has asked to be relieved of this particular load and, after a brief discussion, E. J. Horley was asked to undertake the representation. This he readily agreed to do.

Standard Methods

The issue of IP "Standard Methods for Testing Petroleum and Its Products" is, without doubt, one of the most valuable services which the Institute performs for the petroleum industry but the editorial effort required to issue this publication at yearly intervals is becoming an almost intolerable burden. We are therefore faced with three possibilities. First, to issue "Standard Methods" every two years; secondly, to issue standard methods in loose-leaf form; and thirdly, to issue supplements at six-monthly intervals with complete reprinting of the book every two years. All members of Council are aware of the importance of this matter and it need hardly be stressed that the subject was thoroughly ventilated. It now rests with Colonel Auld's *Ad Hoc* Committee to consider the advantages and disadvantages of each proposal and submit a final recommendation for Council to transmit to the Standardization and Publications committees. The growing co-operation with ASTM regarding methods of testing is a matter on which Standardization Committee is to be congratulated and readers will, of course, realize that this co-operation focuses even more attention on the future mode of publication of IP "Standard Methods."

Summer Meeting

Members will doubtless be pleased to learn that considerable progress has been made in the planning of next year's Summer Meeting which will take place from 12 to 15 May 1954 at Llandudno. The theme will be "The Rôle of Petroleum in Modern Transport" and will be dealt with in five main sessions comprising nine papers in all. Publications Committee now has the task of deciding the types and titles of papers to be presented and in the very near future members will learn more of the essential technical details.

World Congress

The British National Committee of the Fourth World Petroleum Congress reported that they had obtained a representative selection of papers and authors and this has been submitted to the Italian authorities who will be responsible for the 1955 Congress.

Economics and Operations Group

Before closing this somewhat brief survey of Council's deliberations, mention must be made of the first meeting of the Economics and Operations Group organized by O. F. Thompson. This meeting was an outstanding success which it is confidently hoped will be repeated.

* * *

Flameproof Handlamp. The Simplex Electric Co. Ltd. has recently issued a leaflet describing what is said to be the first handlamp to be granted a Buxton certificate for use in dangerous atmospheres, such as might be met with in oil refineries.

DUTCH INSECTICIDE PLANT

A new plant is being constructed at Pernis (Rotterdam) refinery for the production of two new insecticides—aldrin and dieldrin. Hitherto manufactured solely in the U.S.A., these insecticides have been employed successfully for the control of soil insects, cotton pests, locusts, ants, and many other insects, including both the *Anopheline* and *Culicine* mosquitoes, which are respectively the carriers of malaria and filariasis.

A gigantic swarm of young locusts (fourth and fifth stage hoppers) on an island in the Tigris River, Mosul area, Iraq.

Aldrin attracted worldwide attention in 1951, when the Persian government appealed for help in combatting its worst locust plague for 80 years. 13 tons were flown to Iran and applied at the recommended strength of 2 oz per acre. Within 24 hours 98 per cent of the insects were killed.

* * *

LONDON BRANCH TO COMMEMORATE WRIGHT BROTHERS JUBILEE

On 17 December, the 50th Anniversary of the Wright Brothers first flight, the London Branch of the IP is holding a joint meeting with the London Graduate Section of the Royal Aeronautical Society to view a first showing of the film "Powered Flight—The Story of the Century." This film has been made by the Shell Film Unit in celebration of the anniversary.

The meeting, which is at 6.45 p.m. (tea 6 p.m.), will be followed by a dinner at the Bolivar restaurant (price 11s. inclusive of gratuities and to be paid after the dinner). Members may bring one guest only to the meeting and tickets for both meeting and dinner are necessary. Application should be made to S. C. Price, Monsanto Chemicals Ltd., Victoria Station House, Victoria Street, London, S.W.1.

OIL FOR MULE SPINNING

The Minister of Labour and National Insurance has made regulations* which specify the type of oil to be used for oiling mule spindles in factories in which the spinning of cotton, staple fibre, and mixtures of cotton and staple fibre by means of self-acting mules is carried on. The regulations, which come into operation on 1 July 1954, also provide for the medical examination of persons engaged in such spinning.

*S.I. 1953 No. 1545. The Mule Spinning (Health) Regulations 1953, obtainable from H.M. Stationery Office or through any bookseller, price 3d. net.

PETROLEUM IN PARLIAMENT

Oil Pollution

The Minister of Transport was asked on 23, 26, and 28 October what steps had been taken to implement the recommendations of the Committee on the Prevention of Pollution of the Sea by Oil.

He said that many of the recommendations called for legislation but that the British shipowners organizations had advised their members to give effect voluntarily to these recommendations which they could put into force at once. On the question of chemical research into means of dispersing waste oil, he was advised that such research must take time to produce results. An early solution of the problem must be sought in other directions which he had under urgent consideration.

Abadan Refinery

Asked on 26 October the position of negotiations with the new Persian Government with reference to Abadan refinery, the Foreign Secretary said that such information as he had encouraged him to think that the Persian Government and people understood the sincerity of our desire to see friendly relations restored.

Kuwait Strikes

The Foreign Secretary was asked on 29 October if he had any information about the organizers of a recent strike in the Kuwait oilfields, how much time had been lost in the past year through strikes, and the cause of the strikes. He replied that he was not able to give an answer as H.M. Government are responsible only for the protection and external relations of Kuwait.

Fuel and Power

During a recent (26 October) debate on the British fuel and power industries, the Minister of Fuel and Power mentioned that the Gas Board were experimenting in taking tail gas from the Llandarcy refinery of the Anglo-Iranian Oil Co. Subsequently Mr Alfred Robens referred to the co-operation of the Gas Board and the D'Arcy Exploration Co. in the search for natural gas. Anglo-Iranian, through that exploration company, had done a good job of drilling in seeking oil in this country and had been useful in discovering many other things at the same time.

Later in the debate Mr David J. Pryde said that although oil was not one of the nationalized industries he did not know why, because Scottish Oils was a subsidiary of the Anglo-Iranian Oil Co. and he did not know who owned that company if it was not the Government of the day. There was the greatest apprehension in the oil-bearing area, he said. The shale field produced the finest octane spirit which could be used both for industrial and domestic purposes, but shale was a declining industry.

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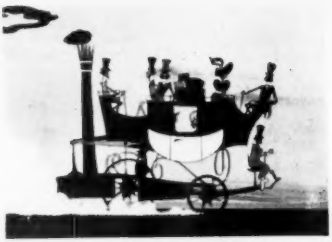
FILMS

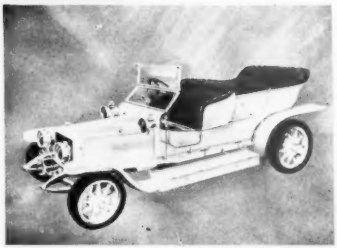
Recent releases of films made by or of interest to the petroleum industry are:

The Farm Adoption Scheme

In order to bring about a better understanding between town and country folk of the part played by farming in the production of food, the Association of Agriculture introduced the Farm Adoption Scheme for schools. Urban schools are invited to adopt a farm or farms and by progress reports, visual aids, and occasional visits the pupils are encouraged to think how much they and the farm workers depend upon each other for survival.



The steam coach of the 1830's (The Moving Spirit) was not at all popular but this "horseless carriage" led to—



—the original Rolls-Royce Silver Ghost of 1907 (The Moving Spirit), and—

In this Shell-Mex and B.P. film the scheme is shown in action producing an interesting 15-minute feature. Copies are available on loan from the Company's head and divisional offices.

Scrapbook No. 5

This new addition to Shell-Mex and B.P. Scrapbook for Farmers series covers a wide range of interest. First it shows the harvesting of seaweed in Scotland for production of animal feeding stuffs. Then, as a reminder that the old-time traction engine is still capable of useful work, a fine collection are shown at their annual meeting racing against each other. After a quick glance at machines for planting and lifting potatoes, the film concludes with an interesting survey of the famous Oathill farm run by George and Frank Henderson and now producing an average of £150 per acre.

Running time is 18 minutes and the film can be borrowed from the head or any divisional office of Shell-Mex and B.P. Ltd.

Mille Miglia 1953

Thrill upon thrill—a 1000-mile race over public roads from Brescia in Lombardy via Padua, Ravenna, Pescara, Popoli, to Rome, and back through Siena, Florence, and Bologna. All classes of cars were represented, from small family saloons to the latest competition models, and the leading drivers of the world were there. A total of 481 cars left the starting point and the producers of the film are to be congratulated on having produced a coherent sequence which retains the full excitement of this testing event. Running time is 28 minutes and all Shell-Mex and B.P. divisional offices have copies available for loan.

—to the modern vehicle of this type (Mille Miglia), the Aston Martin which Reg Parnell and Louis Klemantaski drove to fifth place and first British car to finish.

The Moving Spirit

A B.P. (Anglo-Iranian Oil Co.) colour cartoon film tracing the development of the motor car from the 1880's to the modern streamlined vehicle. In the 18 minutes showing time the interesting story of improvement after improvement is told in the fascinating style of the cartoon film. Copies can be borrowed from Shell-Mex and B.P. divisional offices or from the Petroleum Films Bureau, 29, New Bond Street, London, W.1.

THE COUNCIL OF BRITISH MANUFACTURERS OF PETROLEUM EQUIPMENT

Proposing the toast of the guests at the Tenth Annual General Meeting luncheon of the CBMPE, Douglas Wilson, its chairman, said that between 1947 and 1953 U.K. refining capacity was raised from 2½ to over 25 million tons per year. Formerly much foreign currency had been spent on importing refined products but now the industry had begun to earn currency through exports of such products.

Drilling, refining, and pipeline equipment formerly only obtainable from America had become a dollar earner. There was little doubt that the U.K. would at least keep abreast of any other country in research and facilities to meet the ever-rising demand.

Process research was being carried out by individual companies, but if the U.K. was to achieve independence and to progress, a good deal more research must be done. The Council proposed to foster and encourage research into the thermo-physico-chemical properties of petroleum. British universities could lay greater stress on the technology of petroleum and should give this question urgent consideration. Process research was important, not only in developing original equipment and achieving independence, but also from the national viewpoint.

As this was their tenth anniversary, Mr Wilson referred to those whose vision and far-sightedness had been responsible for their present development—T. L. Bonstow, C. E. R. Sams, and S. T. Robson, their first chairman. He paid a special tribute to Mr. Bonstow, their technical adviser and one of their most valuable assets who had all the enthusiasm of perennial youth.

The Rt. Hon. Geoffrey Lloyd, M.P., Minister of Fuel and Power, responding to the toast, said it was interesting to dwell upon the formation of the Council, a happy example of co-operation between industry and a Government Department. The Department concerned was a very small one but it had a very remarkable official—F. C. Starling. Sufficient honour had never been done to Mr Starling's great work during the war in handling petroleum and in the planning between the wars.

The Department had had a big respect for the petroleum industry and had had the assistance not only of leaders in the petroleum industry, including the late Lord Cadman, but also of other practical men including A. C. Hartley, H. A. Hammick, and B. J. Ellis.

Concluding, the Minister said that in its ten years of life the Council had seen the petroleum equipment industry become of growing importance to the U.K. He agreed with the chairman that it was now time to prepare for developmental research which would give British industry the technical know-how to produce better equipment than could others.

The Annual Report

The Chairman's Report 1952-53 is an impressive document of 25 pages reporting progress in all phases of the Council's main activities—educational, publicity, and propaganda. Membership in September 1953 totalled 394, compared with 373 a year before.

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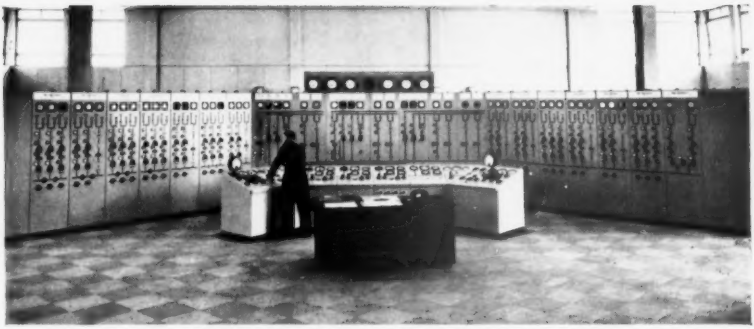
Export Challenge. G. A. Harvey and Company have despatched a flash fractionating column valued at £20,000, to the U.S. controlled Bahrein refinery. The column has an overall length of 72ft, a diameter of 8ft, and weighs 48 tons. Time was the essence of the contract, and there was some reluctance to place the order in the U.K., on account of reputed delays in delivery. The manufacturers regarded this as a challenge to British industry, and completed the work within one-third of the time originally allowed.



POWER CONTROL IN A MODERN REFINERY

The power house control room at Anglo-Iranian's Llandarcy refinery. As a result of the expansion programme, the capacity of this refinery has risen from 360,000 to four million tons per annum.

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CHEMICAL ENGINEERING

A European federation of chemical engineering was formally inaugurated at a foundation meeting held in the *Maison de la Chemie*, Paris, on 20 June. The purpose of the federation is to promote European co-operation in the fields of chemical engineering and equipment.

POST-GRADUATE SCHOLARSHIPS

This autumn six young scientists (two each from Australia, New Zealand, and South Africa) will begin two years' post-graduate work at British Universities. They are winners of £750-p.a. scholarships, offered by Shell to encourage study and research in sciences that relate to petroleum.

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BRITAIN'S BIGGEST ROAD TANKER

The Shell-Mex and B.P. 4000-gallon motor spirit tanker photographed on its first journey. Although of lightweight construction, the new tanker weighs over 8 tons. Hitherto the largest tanker permissable on British roads had a capacity of 3000 gallons.

North Borneo

Shell have obtained a concession in North Borneo covering an area of about a thousand square miles, split into two parts—the Dent Peninsula on the East coast and the Klias Peninsula on the West coast.

A gravity survey is being made on the Dent Peninsula in an attempt to discover more data on the potentialities of the area.

Deep exploration drilling is being planned for next year on the Klias Peninsula, where a number of wells have been drilled in the past, but without encountering oil in commercial quantities. At present engineers are bulldozing

Bulldozers clearing the way for the road to the drilling site on the Klias Peninsula, North Borneo.

a causeway across about 200 yards of coastal swamp, and building seven miles of road through hilly jungle country, and a final mile of road through deep mangrove swamp.

The route to the location selected for drilling at Klias will involve the employment of war-pattern tank landing craft to carry heavy lorries loaded with the 450-ton drilling and auxiliary equipment from Seria to the Klias area. The lorries will run ashore on a small but specially built jetty, and then follow the new road to the drilling location.

At present it is planned to drill the well to a depth of 7000 ft.

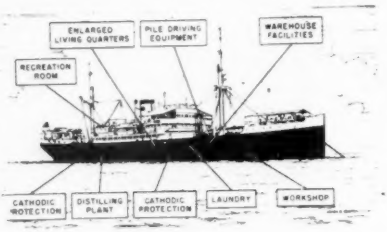
Map showing the location of the two proposed drilling sites in North Borneo.

Persian Gulf

In 1952, Shell acquired a concession from the ruler of Qatar to carry out oil exploration beneath the waters of the Persian Gulf. Since then a 4081-ton merchant vessel has been acquired, re-equipped, and sent to assist in the search.

The ship—the *Shell Quest*—now accommodates about 140 persons, and its facilities include increased refrigerating capacity, and the installation of air conditioning equipment, workshops, warehouse, plant for making fresh water from sea water, and a heavy lift device. New installations also include an emergency operating theatre, a recreation room, and a laundry.

To avoid having to drydock the ship from time to time in order to paint the underwater part of the hull, a cathodic protection plant is being installed. This includes special generating equipment which will pass electric currents out into



An artist's impression of the Shell Quest *indicating the main features of her conversion.*

the surrounding sea water and back through the ship's hull. These currents will prevent any corrosion of those portions of the hull in contact with the water.

The protection current is provided by two motor generators, installed in the engine room, which convert the ship's 220-volt mains supply into a low voltage supply, controllable over a wide range. Four anode groups of the type illustrated are immersed well below the water line.

The new ship, by serving as a floating depôt for men and equipment, will greatly assist the work of exploration.

Plungar

A test well being drilled by D'Arcy Exploration Co. at Plungar, near Nottingham, has produced a small quantity of crude-oil at a depth of 2821 ft.

Drilling was continued in search of a lower stratum of oil-bearing rock, but tests proved only the presence of water.

The potentialities of the reservoir at around 2820 ft are to be tested, and Geophysicists are carrying out a seismic survey near Plungar.

Assam Valley

Seismic, gravity, and aeromagnetic surveys are to be carried out over a 5000-sq. mile area of Assam during the coming dry weather to "feel" for oil possibilities beneath the alluvium of the Brahmaputra Valley.

The Assam Oil Co. Ltd. recently struck oil in a well drilled to a depth of 10,000 ft at Nahor Katiya, near the southern edge of the alluvial plain, and it is this important development which opens the way for a new assessment of the valley's petroleum possibilities.

Eastern Nigeria

A small indication of oil has been encountered in a test well being drilled in the Calabar province of Eastern Nigeria by The Shell D'Arcy Petroleum Development Company of Nigeria Limited. This follows many years of intensive exploration in that area. It is too early to state whether this may lead to production of oil and if so whether such production may be on a commercial scale. However, testing is being carried out.

Lowering one of the four anode frames for the cathodic protection system of the hull on the Shell Quest.

Lancashire

To determine the underground structure in the Formby area, D'Arcy Exploration Company has started a shallow bore drilling programme. If the drilling confirms underground folding, deeper drilling will be undertaken. Dr P. E. Kent recently gave an account of geophysical exploration and drilling results in the Formby area to members of the British Association for the Advancement of Science.

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Chemical Treatment of Oilwells. The use of chemicals to prevent acid corrosion from sour crudes and also to kill sulphur-oxidizing organisms in oilwell water systems is dealt with in Technical Bulletins E-3 and E-6 recently issued by the chemical division of Armour and Co. Ltd. Copies are available from the Company at G.P.O. Box 250, Lindsay Street, London, E.C.1.

PERSONAL NOTES

Sir William Fraser, C.B.E., LL.D., chairman of A.I.O.C., has been created an officer of the Legion of Honour. The insignia was presented to Sir William by M. Louvel, Minister of Commerce, for his services to the French national economy. It also marks the French Government's approval of the help given by Sir William and the A.I.O.C. in the construction of the Dunkirk refinery, and in the overseas marketing of the products of the Company's associate, Société Générale des Hurles des Pétrole, BP.

Kenneth J. Balsillie (l) *speaking at the Esso dinner given in his honour at the Dorchester Hotel. Among those present were Leonard Sinclair* (c) *and Howard Page* (r).

Sir Roger Duncalfe was recently elected president of the British Standards Institution. Sir Roger is chairman of British Glues and Chemicals Ltd. and he has been associated with the B.S.I. for more than 20 years. He has been successively chairman of technical committees engaged on standard projects, chairman of the Chemical Divisional Council and of the Institution's Finance Committee and General Council, and more recently its vice-president. He was knighted for his outstanding contributions to industrial standardization at the time of the B.S.I. Golden Jubilee in 1951.

W. H. Critchlow, M.B.E., has been appointed general sales manager of the Esso Petroleum Company. A new assistant general sales manager will be **E. F. Choppen.** Both Mr Critchlow and Mr Choppen served on Regional Petroleum Boards during the second world war. Mr Choppen is succeeded by **B. A. Tunks** as Manager of the Northern Division. Esso also announce the appointment of **E. W. Hardiman, M.Inst.Pet.,** as manager of their South-Western Division.

John Franklin, M.B.E. We regret to announce the death of Mr Franklin who died in hospital on 13 October, as a result of a recurrence of a rare tropical disease which he first contracted while on war service in North Africa. After a temporary recovery Mr Franklin fought both in Normandy and in Holland. He also enjoyed good health after the war and travelled widely, visiting many overseas markets.

Kenneth J. Balsillie, managing director of Esso Transportation Co. Ltd., retired on 30 September, after serving the shipping interests of the Esso group for nearly 50 years.

He has been a representative of the Britannia Steam Ship Insurance Association on the Council of the Chamber of Shipping of the U.K. and Executive Council of the Shipping Federation Ltd. for many years, and has served on the Tanker Committees of those bodies.

He recently served on the Government committee on the prevention of pollution of the sea by oil. He is a director of the Persian Gulf Lighting Service and H. Clarkson and Co. Ltd.

L. H. Coney, M.B.E., was recently appointed lubricants co-ordinator of Shell-Mex and B.P. Ltd. He was appointed manager of the Cardiff Division in 1948 and manager, Western Division, Bristol, in June 1950. For the past two years he has been at Head Office.

CHEMICAL ENGINEERING

PART V—REFRIGERATION

By D. C. FRESHWATER

Refrigeration may be defined as the cooling of a material or product to a temperature below that of the atmosphere or of the available cooling water. It is a comparatively new process compared with the unit operations, such as fluid flow, heat transfer, and distillation. Its first applications were in the food and allied industries but the petroleum industry was quick to realize its potentialities, and it is now applied in diverse processes, such as the recovery of casinghead gasoline from natural gas, the extraction of wax in lubricating oil refining, solvent refining processes, *e.g.* those using liquid sulphur dioxide and propane, and the liquefaction of gases, such as propane and butane, prior to their separation by distillation.

Refrigeration as defined above consists essentially of removing heat from the fluid required to be cooled in order to bring it to a suitably low temperature, and rejecting this heat to a second fluid (usually the atmosphere) at a higher temperature. This is an apparent contradiction of the second law of thermodynamics which states that "heat cannot of itself flow from a colder to a hotter body." This is resolved since refrigeration is normally accomplished by using a fluid as a heat transfer media, which is recycled between the cold space and the refrigerator. In order to take up heat from the cold space the heat transfer media, or refrigerant as it is called, must be at a temperature lower than that of the cold space itself. After taking up heat, the refrigerant is then transferred to a refrigeration machine where its temperature must be raised to a value higher than that of the atmosphere or cooling water in order that heat may flow or be rejected from the refrigerant.

Usually the refrigerant is recycled continuously between the cold space and the refrigeration machine and only rarely is the process intermittent. This recycle involves the additional step of reducing the temperature of the refrigerant to its original low value after it has rejected heat to the atmosphere. The alternate raising and lowering of the temperature of the refrigerant which enables it to be at the correct temperature level to receive or reject heat is the essential feature of all refrigeration machines. It is effected most simply by using a suitable compressible fluid as the refrigerant, since if mechanical work is done on a compressible fluid, *e.g.* its pressure is increased, the temperature of the fluid rises, and when it does work itself, *i.e.* it expands, the temperature falls.

In practice the refrigerant circulates in a closed cycle between the cold space and the refrigeration machine, and the events described above occur continuously. Mechanical systems of refrigeration have reached a high degree of development in response to the great increase in the use of cooling on a large scale in industrial processes.

Mechanical Refrigeration Systems—General

Mechanical refrigeration systems can be divided into two main types, compression systems and absorption systems, depending upon the method of supplying the energy to recirculate the refrigerant and to raise it from the temperature level of heat reception to the temperature level of heat rejection. In the compression system, energy in the form of work is put into the system by means of some kind of pump, which may be of the reciprocating, rotary, or centrifugal types (see Part II—Fluid

Flow). In the absorption system, circulation is effected by absorbing the refrigerant in some suitable liquid or solid in one part of the apparatus and regenerating it from the resultant solution by the application of heat in another part of the system. All continuous absorption systems use a fluid, usually liquid, absorbent because of the difficulty of moving a solid around the system.

Compression Machines

These are the most widely used types of refrigeration machines and in the compression system the refrigerant may be either a gas or a vapour. In this article, vapour is defined as a gaseous substance below its critical temperature, *i.e.* it can be liquefied by the application of pressure alone. However, machines operating with vapour are by far the most common. There is one gas cycle, that using air, which is of both historical and theoretical interest, but it is not of industrial importance and is not dealt with in this article; those interested should refer to any standard text on refrigeration, one of which is given at the end of this article. Briefly, machines using vapours have a big advantage over those using gases, because the refrigerant may be condensed and re-evaporated, and the latent heat of condensation is available. As latent heat is generally large in comparison with specific heat, a given mass of refrigerant has a much larger potential heat capacity if it is capable of being liquefied than if it is a gas.

Consider then a typical vapour compression system of refrigeration, as shown diagrammatically in Fig 1.

Note in the description which follows, how the essential steps, referred to earlier, of raising and lowering the temperature of the refrigerant by the machine are achieved.

Vapour is compressed in the machine thus increasing its temperature. At the same time, the increase in pressure brings the vapour near to its saturation point, so that on cooling it condenses, rejecting heat to the cooling water in the form of latent heat of condensation. The liquid under pressure then passes through an expansion valve. Now the refrigerant in the condenser is only in the form of a liquid because of the pressure exerted on it, and when it passes through the expansion valve it is at a much reduced pressure; consequently its temperature is above the boiling point of the liquid at the new pressure. This represents a state of instability and equilibrium is reached by the liquid being vaporized on passing through the expansion valve. However,

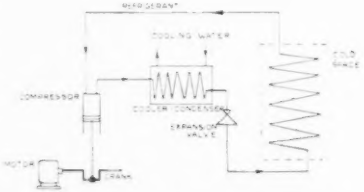

Fig 1. Typical arrangement of a compression type refrigeration unit.

assuming the valve to be perfectly heat insulated, the latent heat of vaporization can only come from the heat contained in the liquid itself, therefore any vaporization that occurs, lowers its temperature. Since refrigerants are chosen so that their latent heat is large compared with their specific heat, even a small amount of vaporization will result in a considerable lowering of temperature. So equilibrium is quickly reached as the temperature of the liquid falls to that corresponding to the boiling point under the new pressure obtaining.

The cold mixture of liquid and vapour then passes through the cold space, abstracting heat from it, which heat in turn vaporizes the remaining liquid. The vapour leaving the cold space returns to the compressor, and so completes the cycle. Where the working

fluid or refrigerant is a liquid-vapour mixture, as in this system, the thermodynamic cycle is best represented by what is known as the Rankine cycle, and the efficiency or coefficient of performance, as it is termed in refrigeration technique, is the net refrigerating effect. This is the heat removed from the cold space divided by the work done, *i.e.* the heat equivalent of the mechanical energy put into the compressor by its engine or motor.

This type of refrigeration process is the most common in industry, and may be operated with a variety of refrigerants.

Choice of Refrigerant for Compression Machines

The factors influencing the choice of refrigerant may be summarized as follows: (a) The latent heat should be high so as to increase the refrigerating effect for a given temperature or pressure rise; (b) the specific volume should be low, *i.e.* density should be high, so as to reduce the size of plant required; (c) the specific heat of vapour and liquid should be low compared with the latent heat; (d) the boiling point at reasonably low pressures should be above the temperature of the cooling water; and (e) the refrigerant should be non-corrosive and non-toxic.

No one substance completely meets all these requirements and a compromise is necessary in practice. Amongst the fluids most generally used for petroleum refining today are ammonia, freon, butane, propane, ethane, and ethylene. Carbon dioxide and sulphur dioxide are also used to a limited extent. Table I shows for purposes of comparison some of the factors listed above for common refrigerants.

TABLE I

PROPERTIES OF SOME COMMON REFRIGERANTS

Refrigerant	Latent Heat B.T.U./lb. at 32°F.	Specific Heat B.T.U./lb./°F.	Boiling Point °F. at Atmos. Press.
Carbon dioxide	100	0.59	−110
Sulphur dioxide	162	0.24	14
Ammonia	620	1.12	−28
Propane	161	0.87	−47

Choice of Compressor

The compressor used in compression refrigeration machines may be either reciprocating or centrifugal. The choice is based mainly upon the low temperature required and the size of the load. Where high loads and very low temperatures are required, such as in the recovery of casinghead gasoline, centrifugal compressors are employed. Reciprocating machines are generally larger for a given refrigerating capacity than centrifugal ones, but for moderate-size installations they tend to be lower in first cost and more efficient than centrifugal machines as the size decreases.

Absorption Machines

The absorption system of refrigeration (Fig 2) has regained its earlier importance in recent years. The refrigerant used in such systems is nearly always ammonia. Cool liquid ammonia from the condenser is brought to the desired low temperature by expansion through a valve. The cold

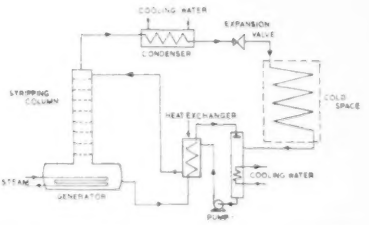

Fig 2. Typical arrangement of an absorption type refrigeration unit.

liquid-vapour mixture passes through a brine cooler where it is completely vaporized as it abstracts heat from the circulating brine.

So far the process is similar to those previously described but there is a difference in the recovery of the refrigerant. The ammonia vapour leaving the brine cooler is absorbed in a weak solution of ammonia in water which is introduced as a spray into the top of the absorber. The vessel has cooling coils (using water cooling) as the absorption is accompanied by the evolution of heat. The resultant solution is then pumped to a distillation column where the strong ammonia is recovered as vapour at the top of a stripping column. The weak ammonia solution which results at the base of the distillation column passes through a heat exchanger where it is cooled against the incoming feed from the absorber and then goes to provide the absorbing liquid.

The vapour from the top of the distillation column passes to the condenser and thus completes the cycle. The ammonia-water mixture cannot be separated completely by distillation and so the refrigerant contains a small amount of water and similarly the absorbent contains some ammonia in solution. Since the system operates on a closed cycle there are no losses (apart from leaks). The absorption system was developed quite early in the history of refrigeration, but was abandoned for many years after the advent of the then more efficient vapour compression type machines. Much development work has been carried out on the process in the past 10 to 15 years, giving a much improved efficiency so that it can now compete once more with the other system of refrigeration. The absorption system is particularly useful where low-grade heat, such as exhaust steam, is available, since heat in such a form is of little use for doing mechanical work and therefore what may normally be a waste product may be made to produce a useful effect.

Evaporative Water Cooling

Evaporative water cooling or the steam jet vacuum system is the third main type of refrigeration used by the oil industry. The system (Fig 3) is essentially a water cooling device but is classified properly as refrigeration since it produces water at a temperature lower than that of the atmosphere or normally available water.

Where a process requires cooling at temperatures in the region of 35° to

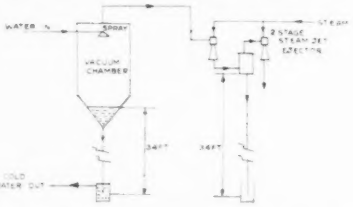

Fig 3. Typical arrangement of a steam-jet vacuum tybe refrigeration unit.

50°F which is below the temperature of normal cooling water derived from town's mains, rivers, or wells, this system may with advantage be employed in preference to a more complex and usually more costly refrigeration system of the type already described.

The water to be cooled enters the chamber through a spray which subdivides it into droplets, thereby presenting a large surface area for evaporation. The chamber is exhausted to such a vacuum that the pressure obtained inside is lower than the saturation pressure of water vapour at the temperature of the incoming water. This is analogous to the conditions before and after the expansion valve in a vapour compression refrigeration system.

Some of the water evaporates, and since the necessary latent heat comes from the sensible heat already in the water, its temperature falls. The chilled

water leaves the chamber, usually through a barometric leg, *i.e.* a column of water enclosed in a pipe of a height equal to or greater than 34 ft which is the head equivalent to the difference in pressure between the atmosphere to absolute vacuum. An extraction pump may be used but is more costly and less simple and certain in operation.

The vacuum inside the chamber is produced and maintained by a steam ejector (see Part II—Fluid Flow). This compresses the water vapour formed in the chamber and discharges it along with any dissolved gases in the entering water which are released to atmosphere. A two-stage ejector is shown which is capable of producing a vacuum of the order of 28·5 to 29 inch Hg. Since ejectors are somewhat inflexible machines it is usual to have two or more connected to the chamber in parallel, the additional ones being turned on or off as the load increases or decreases.

The success of such units depends mainly on the mechanical efficiency of the steam jet ejectors, which, with proper design, can be quite high. One authority gives the steam consumption as 25 to 30 lb steam at 100 p.s.i.g. for a refrigeration effect of 12,000 B.T.U/hr. Since the ratio of latent heat to specific heat of water is about 1000 : 1, only a small proportion of the water entering need be evaporated in order to produce an appreciable drop in temperature.

Units of Refrigeration

Refrigeration loads are usually given in terms of tonnage or tons of refrigeration per day. This is really a rate of heat removal and is defined as the heat required to melt 2000 lb of ice in 24 hours.

The latent heat of fusion of ice is 144 B.T.U/lb. Therefore, 1 ton of refrigeration is equivalent to $144 \times 2000 = 288{,}000$ B.T.U/day or $288{,}000/(24 \times 60) = 200$ B.T.U/min. This is the standard U.S. unit. The British unit is slightly different, being based on a rate of cooling of 1 k.cal. per sec and is equivalent to 237 B.T.U/min.

Method of Application of Refrigerants

There are two main ways in which the cold refrigerant produced by a machine may be used. Either the refrigerant itself may be circulated directly through the process unit which is to be cooled or it may circulate through coils immersed in a brine tank and the cool brine is then pumped round the process unit. The first method, known as direct expansion, is commonly used with Freon and carbon dioxide refrigeration. However, brine circulation is more usual than direct expansion because there is less danger from leaks or bursts. Moreover, this system adds flexibility to the refrigerating plant, enabling processes remote from the machine to be cooled without the use of expensive pipework to carry the refrigerant at high pressures.

A further advantage is that the relatively large mass of brine which is in the circulating system provides a capacity which can take up small load changes and provide a reserve in case of breakdown of the refrigeration machine. Brines are usually solutions of sodium chloride, magnesium chloride, or calcium chloride, the last being the most common since it is less corrosive.

Cascading in Refrigeration

Although most refrigerants can be used over a wide temperature range it is not advisable to have a large difference between the temperature of heat reception and that of heat rejection since the coefficient of performance will then be poor. The upper limit of temperature is normally fixed by the temperature of the cooling water. Where very low temperatures are required it is usual to reach them in a number of stages. Thus the refrigerant produced by one machine, using cooling water for the heat reception end of the cycle, is made

to serve as the heat reception medium for a second machine which then gives a second refrigerant at a much lower temperature. This may be repeated as many as three or even four times. Moreover, since different refrigerants give their highest efficiencies at different temperatures the refrigerants used in various stages may not be the same. Such a system is known as cascading.

Refrigeration Applications

A brief survey of a few of the more important applications of refrigeration in refinery and petrochemical plants follows:

Dewaxing. This is one of the earliest applications of refrigeration in an oil refinery. In the first processes lubricating oils were cooled to such a temperature that the waxes in them crystallized out, when they could then be removed by a mechanical separation method, such as filtration. In more modern processes the wax is removed by solvents, notably methyl ethyl ketone-benzene mixtures or propane, but their selective solubility action is assisted by low temperatures, hence these processes still require refrigeration. The use of solvents also reduces the fouling of heat exchanger surfaces on the oil side by wax solidifying on them, which was one of the main practical difficulties of the older process.

Recovery of Cracking Gas. Valuable constituents in the gas streams from cracking plants comprising methane, butane, and propane may be recovered by liquefaction and subsequent distillation under pressure.

A considerable amount of cooling is required in the liquefaction of such gases and also very low temperatures may be necessary. When this is the case cascaded circuits are used, and both ammonia absorption and vapour compression types of machines have been employed.

Edeleanu Process. In this refining process undesirable aromatic compounds are removed from kerosines by dissolving them in liquid sulphur dioxide. This is carried out under pressure and at a low temperature in order to keep the sulphur dioxide in the liquid state. It is an interesting special case since sulphur dioxide itself is a refrigerant. Thus the cold liquid from the machine may be fed directly into the solvent extraction unit to serve the dual purpose of solvent and refrigerant.

Chemical Processes. In many of the chemical processes of refining, such as alkylation, polymerization, and synthesis it is necessary to use refrigeration either to remove the heat of reaction or because the desired chemical reaction is favoured by a low temperature. Standard compression machines may be and are often used, but if the load is variable, it is usually carried by large absorption or centrifugal refrigerators. One advantage of centrifugal machines in this respect is that they are particularly well suited to hydrocarbon refrigerants; use is thus made of refinery products and so tends to be slightly cheaper to operate.

A number of other applications of refrigeration, such as air conditioning, production of oxygen and solid carbon dioxide or dry ice, may be mentioned but these are of minor interest to the oil industry in the U.K. It should be clear, however, from the examples already given that refrigeration is an important tool for the chemical engineer and it may confidently be said that its importance is likely to increase as the demand for greater efficiency and production increases.

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AROUND THE BRANCHES

FAWLEY, LONDON, NORTHERN, PERSIAN GULF, SCOTTISH, SOUTH EASTERN, SOUTH WALES, STANLOW, TRINIDAD

London Branch

The second meeting of the present session was held on 21 October at Manson House when a talk entitled "Geological Adventures" was given by Dr G. M. Lees, M.C., D.F.C., F.G.S., F.R.S. Dr Lees commenced his talk by saying that he was not quite sure of the exact implications of the title but that he had decided against presenting a paper in the accepted sense and to deliver instead an informal talk on his adventures and experiences in the oil industry.

The speaker considered that he had now reached the period of life which he described as the "anecdotage"—this being the time of life when retired gentlemen sit back and enjoy recounting their past experiences. The "anecdotes," however, in this case, were so absorbing and told in such an engaging manner that the meeting, which was very well attended, could have happily listened to Dr Lees for the rest of the evening.

During the first world war Dr Lees had many adventures as a pilot, perhaps the most amusing of which was when he stampeded a race meeting with an aerobatic display, which, knowing Dr Lees, was probably a sort of "One man Farnborough." After the war he decided to take up geology having become interested in the subject as a commissioner and after returning to University for a while he subsequently became a geologist in the employ of the then Anglo-Persian Oil Co. Ltd.

His descriptions of the tours undertaken in search of oil necessitating long treks over deserts and mountains were extremely interesting and geology has taken him not only to the principal oilfields of the Middle East, but to almost every other oil producing, or oil bearing land in the world, including the difficult jungles of Papua. Nearer home when on holiday (perhaps a busman's holiday would have been more accurate) near Swanage, he discovered oil seepages on the cliff face and was later primarily responsible for the discovery of the British oilfields in Nottinghamshire and Lancashire.

During the second world war, one of his many tasks was the "Oil Denial" scheme whereby oilfields in Indonesia were to be rendered inoperative in the event of a Japanese invasion. On this occasion Dr Lees became a diplomat settling some of the "on the spot" difficulties between the service and civilian authorities.

One of the most amusing, but doubtless nerve racking experiences in his career was Dr Lees' encounter in the desert country of Persia with an infuriated Arab, and it appears that would-be oil geologists, whilst armed only with a mere geologists hammer, must be prepared to do battle with irate natives brandishing hatchets. In the particular encounter referred to by Dr Lees he brandished his hammer in such a way that the native's nerve gave way and he beat a hasty retreat from the battlefield.

After a number of questions the vote of thanks to the speaker was proposed by the chairman of the London Branch, Mr A. W. Deller, who echoed the sentiments of the meeting in saying how fortunate we had been in having Dr Lees with us. Mr Deller continued by saying that one of the aims of the branch was to encourage younger members of the petroleum industry and talks of this type from such eminent personalities as Dr Lees were invaluable in portraying the interesting and varied careers offered within the industry. The chairman concluded by saying how enjoyable such informal meetings of

this type were, and the vote of thanks was carried with acclamation.

Persian Gulf Branch

The 16th ordinary general meeting of the Bahrein Sub-area of the Persian Gulf Branch was held on 20 September 1953. The main part of the meeting was devoted to the reading of a paper entitled "Evaluation of Cracking Catalysts" by Mr A. N. S. D'Silva (Associate Fellow). This was the second paper prepared by a member of the Bahrein Sub-area and read at an ordinary general meeting.

In his paper, Mr D'Silva described in detail, with the aid of charts and diagrams, the many tests carried out on a cracking catalyst. In addition to the general section dealing with the various catalyst tests, the paper included sections ranging from problems on crack- and the economic aspects of catalytic cracking as opposed to thermal cracking. The paper proved most interesting and was very well received.

After the presentation of the paper, Mr D'Silva answered a variety of questions ranging from questions on cracking catalyst testing procedures to the operation of the catalytic cracking unit in the Bahrein refinery.

The meeting closed with a hearty vote of thanks to Mr D'Silva.

Stanlow Branch

The 95th meeting of the Branch was held at the Grosvenor Hotel, Chester, on 21 October. In the absence of the Branch chairman the Chair was taken by the Hon. Secretary.

A paper entitled "Discovery and Development of an Oilfield" was read by Mr H. R. Lovely of Iraq Petroleum Co. Ltd.

After explaining in outline the general principles governing the deposition of oil, and the location of such deposits by geological surveys and geophysical aids, such as seismic and gravimetric methods, the speaker described the history and development of the Zubair field in southern Iraq. Following a concession granted in 1938 the first wells were drilled in 1948 and oil was discovered in the same year. The deposit was in sandstone at a depth of about 10,000 ft, and the cost of the wells was in the region of £100,000 each, but productivity per well was about 8000 b.d. Considerations governing well planning and spacing were described. Gas separation is undertaken before the oil is pumped to Fao, on the Persian Gulf, for shipment. On the completion of a second line (24 inch) to the port, output from the Zubair field is expected to reach 8 million tons per year. The lecture was illustrated by numerous slides.

A discussion followed and this was opened by Mr W. E. Frankenburg. After a vote of thanks from the Chair the meeting concluded.

South Wales Branch

The second meeting of the 1953-54 Session was held on 1 October at the Training Centre, National Oil Refineries under the chairmanship of Mr J. A. Green, the Branch chairman. The speaker was Dr L. S. Thornes of the Technical Department, National Oil Refineries Ltd., who gave a talk to a large audience, on the subject of catalytic cracking.

Dr Thornes opened his talk by referring to thermal reforming and Houdry's early work and difficulties in the cracking of gas oil over a catalyst. Then followed a description of the catalytic cracking plant developments illustrated with slides covering the thermofor process and moving bed systems. The attempts at combatting loss of catalyst by attrition by using (a) catalyst beads and (b) a slurry of fines were dealt with, and this led to a description of upflow systems and the use of multiple cyclones. Dr Thornes, when talking about circulation rates and residence times, stressed

the need for 100 per cent servicing and maintenance on plants.

At the close of the lecture an interesting discussion took place followed by a demonstration of catalyst flow in miniature equipment *in vitro*.

Mr E. Tnornton proposed the vote of thanks for a most entertaining talk.

Fawley Branch

The Branch commenced its winter session of lectures on 16 October 1953, at the Esso Recreation Club, Holbury, when it was honoured by a visit from Dr G. M. Lees, M.C., D.F.C., Ph.D., F.R.S.

Dr A. W. Pearce, the Process Superintendent of the Esso Refinery, Fawley, introduced Dr Lees to a well attended meeting and observed that their visitor was going to discuss the "Distribution of World Oil Reserves."

Dr Lees explained to the meeting that any forecast regarding oil reserves was only valid for the existing economic conditions. At present, however, the possible reserves represented about 24 years with current rate of usage. They were very unevenly distributed; 99 per cent were located in the Americas, Middle East, Persia, and the U.S.S.R., whilst the remaining 1 per cent was shared between some twenty other countries. The outstanding feature of these figures is that from 1938-51 the reserves located in the Middle East rose from 16 per cent of the total to approximately 50 per cent. Moreover, the fields and wells of this area were many times more productive than any others.

From a study of a world map showing the potential areas of production, Dr Lees demonstrated that many further discoveries were likely, although the finding of any major fields was improbable.

The lecture was followed by some slides illustrating conditions at various oilfields.

Several questions were asked by members of the audience and Dr Lees replied to these very fully.

Mr N. B. Smethurst proposed a vote of thanks to Dr Lees, and it was evident that all present had enjoyed the lecture.

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KNOCK RATING INSTRUMENTATION ON CFR ENGINES

Attention is drawn to an impending change in the knock rating instrumentation on CFR engines for research and motor method testing in accordance with The Institute of Petroleum Standard Methods IP 126/51(T) and IP 44/51 (T), respectively. As from 1 March 1954 the bouncing pin will become obsolete equipment, and will be replaced by the Phillips model 501 and 501A detonation meter in the above methods. ASTM will make similar amendments to their methods D-908 and D-357 as from 1 January 1954. The IP have fixed a later date than the ASTM for the changeover from bouncing pin to Phillips detonation meter in order to allow engine test laboratories sufficient time to instal new equipment.

A full description of the Phillips detonation meter appears in the 1952 edition of the ASTM Manual of Engine Test Methods for Rating Fuels and a note summarizing the reasons for the adoption of the meter as standard instrumentation is given in ASTM Bulletin No. 83, dated July 1952. The advantages claimed for the meter have been confirmed by co-operative tests organized by the IP Knock Rating of Aviation Fuel and Knock Rating of Motor Fuel Panels.

Solartron Laboratory Instruments Ltd., Solartron Works, Queen's Road, Thames Ditton, Surrey, have been appointed U.K. agents for the meter and associated equipment, and all enquiries regarding supply and servicing should be addressed to this Company.

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Microcrystalline Waxes. A.I.O.C. hope to start production of "microwaxes" at their Llandarcy Refinery before the end of the year. This will be the first time that "microwaxes" have been manufactured in the U.K.

OIL POLLUTION RESEARCH

As a contribution to the campaign against the pollution of beaches by oil residue jettisoned by ships, the National Institute of Oceanography will shortly initiate an intensive research into the surface currents in the North Atlantic to the west of the British Isles.

It is planned to drop into the sea 10,000 plastic envelopes, many of which will eventually float ashore on the coasts of Britain and other N.W. European countries. Each envelope will contain a franked addressed postcard, on which will be printed a simple questionnaire, and a small sheet of instructions. Finders who complete and return the card will be rewarded.

The cards will be numbered, and the date and position in which each is dropped will be recorded. It will thus be possible to work out the approximate speeds and directions of the currents from the information received on the postcard.

If a large percentage of the envelopes dropped in any area is recovered, it follows that oil jettisoned in that area is likely to drift ashore.

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U.S. EXPORTS TO CANADA

The British Standards Institution has set up a section to deal with the approval in the U.K. of air receivers, boilers, and pressure vessels intended for export to Canada. Initially, the B.S.I. and the Chief of the Boiler Inspection Department of Quebec drew up arrangements to cover the necessary service and these have now been extended by agreement with the Canadian Standards Association's Committee on Canadian Boiler Regulations to all Canadian Provinces, whose chief inspectors have agreed to accept equipment manufactured in the U.K. provided that:—

(1) The necessary registration with Canada has been effected,

(2) the equipment has been constructed in accordance with the relevant Canadian specifications, and

(3) the necessary inspection during and after construction has been carried out by an accepted Inspection Agency.

The Section of B.S.I. dealing with this matter has been set up in association with the B.S.I/C.S.A. Approvals Agency for electrical equipment, so that it will be convenient for U.K. manufacturers of equipment that have to comply not only with the Canadian Electrical Code but also with the requirements of pressure vessels, such as electrode boilers and electrically operated pressure vessel accessories. As the staff of this section of B.S.I. are familiar with conditions in the engineering industry in Canada, manufacturers are invited to apply to the Institution for full information and help.

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WORLD OIL MAP

The Petroleum Information Bureau has just issued the 1952 edition of its map of world crude oil production and refining capacity. Production totalled 640,380,000 metric tons and refining capacity was 708 million metric tons. Detailed figures tabulated by areas and indicated by appropriate symbols on the map. A graph of world production since the start of the century is given and also an inset map indicating world oil movements. The chart is 40 by 30 inches and costs 2s. post free from the Bureau at 29, New Bond Street, London, W.1.

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"The Atom in Harness." Issued by Shell-Mex and B.P. Ltd. on the occasion of the recent Engineering and Marine Exhibition in London, this booklet describes in an interesting manner the use of radio-active isotopes in the measurement of engine wear.

A film under the title of Project 074 is also available from the Company's offices.

Design and Construction in Steel Plate. Whessoe Ltd. have issued an illustrated booklet which portrays some of the Company's post-war achievements in the manufacture of refinery and chemical plant. Copies may be obtained on application to Whessoe Ltd., 25 Victoria Street, London, S.W.1.

SUMMER MEETING, 1954

The Third Annual Summer Meeting of the Institute will take place from 12 to 15 May 1954 at the Grand Hotel, Llandudno, North Wales. Set in the midst of spectacular scenery, Llandudno is a most attractive resort, and the Grand Hotel, which nestles at the foot of the towering Great Orme, is a first class holiday hotel. If the numbers equal those of this year, the whole hotel is being placed at the Institute's disposal.

The theme of the meeting will be "The rôle of petroleum in modern transport."

A total of seven or eight papers are being arranged for the meeting.

The coach trips, that have proved so popular at previous meetings, will go to Caernarvon and Conway Castles, and will pass through some of the most beautiful scenery in the British Isles.

Golf is available, free, on the famous Maesdu course, and proceedings will commence with a cocktail party and end with a dinner dance.

The Grand Hotel, Llandudno.

It is hoped that, as in previous years, a large number of ladies will attend, and a special welcome will be given to any overseas members and their wives, who are home on leave.

Places can be booked through the General Secretary of the Institute at an "all in" charge of £10 per person.

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WORLD POWER CONFERENCE

Included in the technical programme of the Sectional Meeting of the World Power Conference, which will be held at Rio de Janeiro, Brazil, from 25 July to 8 August, are papers devoted to natural and derived fuels, as follows:

Solid Fuels and their Utilization.
Liquid Fuels and their Utilization.
Gaseous Fuels and their Utilization.
The Influence of Gaseous Fuels on Modern Industry.

Eleven British papers will be presented, including two of special interest to members of the petroleum industry. These are:

Special Refinery Equipment for Tropical and Sub-tropical Areas. By E. leQ. Herbert, B.Sc., F.R.I.C., F.Inst.Pet., M.I. Chem.E.

The Production and Refining of Shale Oil. By G. H. Smith, M.C., Ph.D., A.R.T.C., F.R.I.C., F.Inst.Pet., and D. Stewart, B.Sc., Ph.D., A.H-W.C., F.R.I.C., F.Inst. Pet.

ASTM STANDARDS

At its meeting on 9 September 1953 the ASTM Administrative Committee on Standards approved many new and revised specifications and test methods. These included:

New Tentatives

ASTM hydrometers (E 100-53 T).
API gravity of petroleum and its products by hydrometer (D 287-53 T).
Residual odour of lacquer solvents and diluents (D 1296-53 T).
Specific gravity of petroleum and its products by hydrometer (D 1298-53 T).

Revision of Tentative

Gasoline (D 439-52 T).

Tentative Revision of Standard

ASTM thermometers (including tentative additions) (E 1-53).
Distillation of tars and tar products (D 20-52).
Distillation of cut-back asphaltic products (D 402-49).

HD OILS

In addition to the oils mentioned in this journal (December 1952, page 433; March 1953, page 95; and October 1953, page 337); the following have been approved by the Director of Chemical Inspection, Ministry of Supply, as complying with the requirements of defence specification, DEF 2101, Grade OMD 110:

Suppliers' Nomenclature	*Supplier*
Eckral DEF 30	Curran Oils Ltd.
Speedwell G.D.M.	British Oil & Turpentine Corpn. Ltd.
Accella 30X	Smith Bros. & Co. (Oil Distillers Ltd.).
Snowdrift Mil 30	Snowdon, Sons & Co. Ltd.
Germil 305	Germ Lubricants Ltd.
Langol D 30	Langley Smith & Co. Ltd.
Germil 202*	Germ Lubricants Ltd.
Caltex Deftex HD-30	Regent Oil Co. Ltd.
Motortonic Delta SAE 30A	Compagnie Financière Belges des Pétroles S.A. (Petrofina).
Shell Oil S 3884	Deutsche Shell A.G.
Brit-Gulf M/HD 30	Gulf Oils (Great Britain) Ltd.
Spur. No. 15 Diesel Lubricating Oil	Spurrier Glazebrook & Co. Ltd.
Oil 30-DM	Vacuum Oil Co. Ltd.
Luco Diesel Engine Oil H.D.S. 30	Percy & Halden Ltd.
Tro-Mar. H.D. 30	British Mexican Petroleum Co. Ltd.
Duckhams OMD/110	Alex. Duckham & Co. Ltd.
Motortonic Delta SAE 50A†	Compagnie Financières Belges des Petroles S.A. (Petrofina).
Maxima OMD-110	Maxima Lubricants Ltd.

*Grade OMD 60
†Grade OMD 330

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"OIL AND PETROLEUM YEAR BOOK"

The 1953 issue of Walter E. Skinner's annual directory made its appearance at the end of September. Like the forty-three preceding volumes it contains a mass of useful information on the set-up of the world's petroleum industry. Details are given of 842 companies operating in all branches of the industry with information as to directorate, finance, plant, operations, and such other material facts as have been made available to the compiler.

A buyers' guide to makers of oilfield and refinery equipment is divided under 1117 headings and particulars as to addresses and affiliations of 567 managers and engineers is given.

Publisher is W. E. Skinner, 20, Copthall Avenue, London, E.C.2.

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SHELL TANKERS LTD.

Designed primarily to deal with the operation and management of the Shell fleet, a new company, Shell Tankers Limited, has been formed as a subsidiary of The Anglo-Saxon Petroleum Co., one of the three main operating companies of the Royal Dutch/Shell Group of oil companies and hitherto managers of the Shell fleets.

The new company will take over all operational responsibilities and will also negotiate charters and contracts on behalf of its parent.

The owned tanker tonnage is said to consist of 2¼ million dw tons, and this will be increased to 4 million dw tons by 1957. The present chartered tonnage amounts to some 4½ million dw tons.

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Beilby Memorial Awards. These are made to young men who have made outstanding contributions to problems connected with fuel economy, chemical engineering, and metallurgy. Such work may be brought to the notice of the Administrators, either by persons wishing to recommend a candidate or by a candidate himself, not later than 31 December 1953, by letter addressed to The Convenor of the Administrators, Sir George Beilby Memorial Fund, Royal Institute of Chemistry, 30, Russell Square, London, W.C.1.

The letter should be accompanied by nine copies of a short statement on the candidate's career (date of birth, education, experience, degree and other qualifications, special awards with dates) and a list of references to paper or other works published by the candidate, independently or jointly.

U.K. EXCISE DUTY LOWERED

By the Hydrocarbon Oils (Excise Duty) Order 1953 (S.I. No. 1496 of 1953) the excise duty on hydrocarbon oils was reduced by 6d. a gallon as from 14 October 1953. This reduction is effected by increasing from 9d to 1s 3d a gallon the amount by which the excise duty is less than the corresponding customs duty.

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NEW CHEMICALS FROM W. GERMAN PLANT

Construction at Wesseling is due to start shortly on the first plant in Western Germany for the production of polyethylene (under the registered trade mark of Lupolen) and ethyl benzene derived from oil. Refinery gases from the near-by oil refinery will provide feedstock, and production is planned to begin in 1955.

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£20 MILLION INDIAN PROJECT

Burmah-Shell Refineries Ltd. are building an oil refinery on Trombay Island, Bombay. Completion is expected in early 1955, and the capacity will be two million tons a year—the largest in India. The plant will process Middle East crude, and its output will include petrol, kerosine, diesel oils, furnace fuels, and bitumen.

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MEMBERS HOME ON LEAVE

A considerable number of copies of I.P. periodicals and literature go astray each year due to overseas members proceeding home on leave and failing to notify the Institute whether such literature is to be sent to a temporary address or held for further instructions. It is often impossible to replace literature and the secretariat of the Institute would find it of assistance of the desired notification could be given in good time.

Amongst many new safety devices recently fitted to the Shell tanker Helix *is an over side lift car here shown taking aboard passengers from a barge alongside. The* 18,000-*d.w. ton* Helix *started her sea trials in October.*

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COMPANY PRODUCTION

	Sept. 1953 *Tons*
Iraq Petroleum Co. Ltd. (Kirkuk)	2,012,968
Basrah Petroleum Co. Ltd. (Zubair)	244,256
Mosul Petroleum Co. Ltd. (Ain Zalah)	111,130
Qatar Petroleum Co. Ltd.	351,482
Kuwait Oil Co. Ltd.	3,347,603

	Oct. 1953 Brl
Kern Oil Co. Ltd:	
California	110,599
Trinidad	24,390

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New Platformers. Two new platforming units for the production of high-grade motor spirit have been ordered for the Anglo-Iranian Oil Company's Llandarcy and Kent refineries. Four other platformers have been ordered for AIOC associates at Lavera, Hamburg, Aden, and Kwinana. All the platformers will have a capacity of about 250,000 tons p.a., except that at Aden which will have a capacity of 500,000 tons p.a. approx.

FORTHCOMING MEETINGS

The Institute

The Stability and Compatibility of Fuel Oil and Diesel Fuel. C. W. G. Martin, F.R.I.C., M.Inst.F., and D. R. Bailey (The Shell Petroleum Co. Ltd.). At 26, Portland Place, London, W.1, 5.30 p.m. (tea 5 p.m.), **13 January.**

Fawley Branch

Lubrication. E. M. Dodds, D.Sc., M.I.Mech.E. At Esso Recreation Club, Holbury, 7.30 p.m., **8 January.**

A.G.M. At Esso Recreation Club, Holbury, 7.30 p.m., **22 January.**

London Branch

"Powered Flight—the Story of the Century." A film. Joint Meeting with London Graduate Section, Royal Aeronautical Society. At 26, Portland Place, London, W.1, 6.45 p.m. (tea 6 p.m.), **17 December.** (*Tickets necessary—see p.* 399.)

Ocean Transportation of Oil. E. H. Thompson, A.C.I.S., F.C.I.I. At 26, Portland Place, London, W.1, 6 p.m. (tea 5.30 p.m.), **19 January.**

Northern Branch

Film Show and Hot Pot Supper. At Warner's Theatre, Manchester, 5.45 p.m., **15 December.**

Mechanical Handling in the Petroleum Industry. S. J. Treen. At the Engineers' Club, Albert Square, Manchester 2, 6.30 p.m., **19 January.**

Scottish Branch

A.G.M. and **Fire Measures and Civil Defence.** J. Glasgow and H. M. R. Auchterlonie. At North British Station Hotel, Edinburgh, **7 January.**

South Eastern Branch

Film Show. At King's Head Hotel, Rochester, 7.45 p.m., **5 January.**

South Wales Branch

The Anglo-Iranian Oil Co. Ltd. D. A. Howes, D.Sc., Ph.D., F.R.I.C. At the National Oil Refineries Training Centre, Llandarcy, 5.30 p.m. (tea 5 p.m.), **7 January.**

Stanlow Branch

Manufacture and Applications of Grease. J. B. Matthews, B.Sc., Ph.D., F.R.I.C. Joint meeting with the Royal Institute of Chemistry. At the Grosvenor Hotel, Chester, 7.30 p.m., **16 December.**

Catalytic Cracking. W. A. Keightley (U.O.P., Chicago). At the Grosvenor Hotel, Chester, 7.30 p.m., **20 January.**

OTHER SOCIETIES

Report on Heavy Oil Engine Working Costs and Performance, 1952 and informal discussion on **Operating Problems.** Diesel Engine Users Association. At Caxton Hall, London, S.W.1, 2.30 p.m., **17 December.**

Some Mechanical Handling Problems in the Chemical Industry. J. Johnston, Institution of Chemical Engineers. At the Geological Society, Burlington House, London, W.1., 5.30 p.m., **5 January.**

An Experimental Investigation into the Effect of Fuel Addition to the Intake of Air on Performance of a C.I. Engine. W. T. Lyn, M.Sc.(Eng.), and **The Effect of Auxiliary Fuels on the Smoke-limited Power Output of Diesel Engines.** (The late) L. D. Derry, E. M. Dodds, M.A., D.Sc., E. B. Evans, Ph.D., M.Sc., F.R.I.C., and D. Royle, B.Sc. (Eng.). At the Institution of Mechanical Engineers, Storey's Gate, St. James's Park, London, S.W.1, 5.30 p.m., **8 January.**

The Stereochemistry of cyclo-Hexane Derivatives. Professor D. H. Barton, Ph.D., D.Sc., F.R.I.C. The Chemical Society. Joint meeting with the Royal Institute of Chemistry and the Society of Chemical Industry. At the North British Station Hotel, Edinburgh, 7.30 p.m., **14 January.**

A New British Stereoscopic Plotting Instrument for Aerial Photographs. Professor E. H. Thompson. The Photogrammetric Society. Joint meeting with the Royal Geographical Society. At Royal Geographical Society, London, 5 p.m., **13 January.**

RADIO-CONTROLLED FUEL TANKERS

Radio-controlled tankers are now speeding up the fuelling of airliners at London Airport. Shell-Mex and B.P. Ltd. announce that they have already equipped four of their largest vehicles and a mobile van: it is intended to instal radio in other vehicles in the fuelling fleet. Not only is this a time-saver, it is reducing substantially the daily mileage done by the vehicles.

At the summer peak the company fuel about 500 airliners a week—or 70 a day—of all the international airlines using the airport. London Airport is 2000 acres in extent and 11 miles round, so that the fuellers have to make long journeys to reach airliners at distant sites.

It is, for instance, 4½ miles from the Shell and B.P. compound to the B.O.A.C. Comet hangar on the south side of the airport—a journey which can take as long as 25 minutes.

No longer is it necessary for a fueller to return to its base for fresh instructions each time it fills an airliner. It can be called up from a central control room in the Shell-Mex and B.P. offices, and redirected to another point as required.

SITUATIONS VACANT

CHEMIST required for the Materials Laboratory of diesel engine manfacturers. Must have experience in the testing of fuels and lubricants and in the examination of engine residues. Post involves other analytical work also, and would provide excellent opportunity for widening experience of engineering materials and of laboratory work. Apply to Box No. 1078, IP Review, giving full details of qualifications, experience and salary required.

Oil Well Engineering Co. An interesting catalogue of British-made drilling and production equipment has recently been issued by The Oil Well Engineering Co. Ltd. of Cheadle Heath, Stockport.

Time Interval Meter. In association with Allied Electronics Ltd., Messrs. Camerer Cuss & Co. have developed a time interval meter suitable for application where accurate timing is necessary. A leaflet is available from the Company.

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"Review of ASTM Research." A complete summarization of the work of the various technical committees of the ASTM, reprinted from the December 1952 to February 1953 Bulletins of the ASTM, is now available in one pamphlet of 22 pages. Copies are available gratis from ASTM headquarters, 1916 Race Street, Philadelphia 3, Pa., U.S.A.

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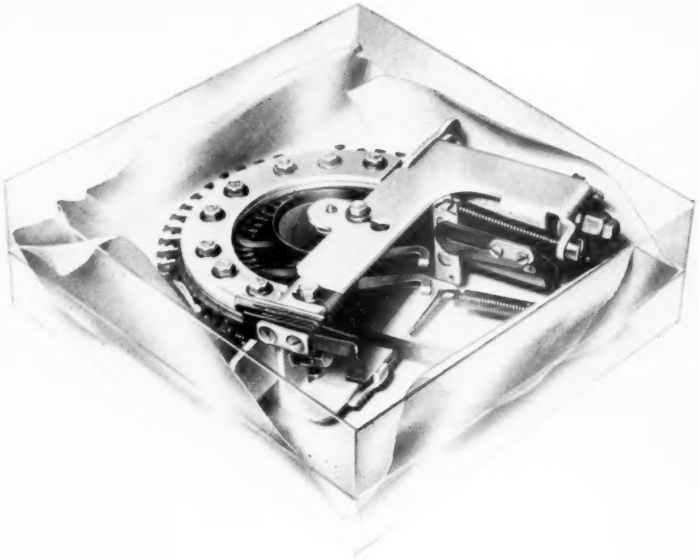
THINGS WORTH DOING



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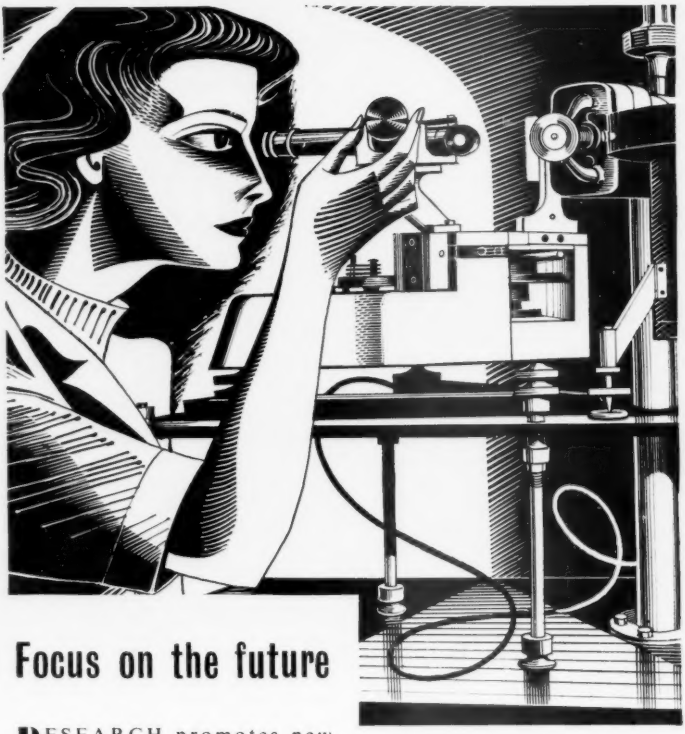


Focus on the future

RESEARCH promotes new knowledge to further the wide activities of Anglo-Iranian Oil Company. Knowledge that means new uses for oil; new efficiency in refining; new economy in operation.

Plant and equipment keep pace with this progress.

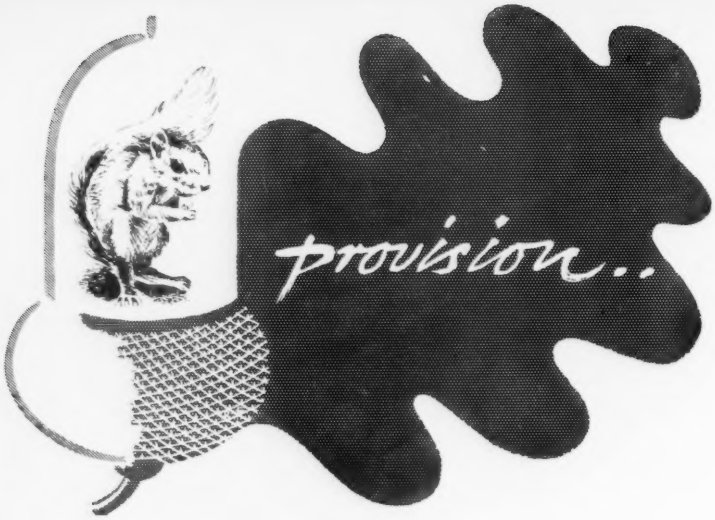
Anglo-Iranian now has three cat-crackers in operation in Britain; two more than any other company. Platformers are being installed at the Lavera and Hamburg refineries. Two new refineries are being built; one at Aden and one at Kwinana in Western Australia.

Hundreds of specialists at its Research Stations are keeping Anglo-Iranian in the forefront of the world petroleum industry.

BP

THE BP SHIELD IS THE SYMBOL OF THE WORLD-WIDE ORGANISATION OF

Anglo-Iranian Oil Company
LIMITED



FOR THE FUTURE

WHEN AUTUMN RIPENS THE NUTS in the hedgerows the squirrel fills his hollow tree and prepares for Winter. Thus provided, he feels no fear for the future. In a world of change, mankind to-day envies the squirrel's certainty of purpose in providing for the days ahead. But, fortunately, there are some who *can* forecast the conditions of tomorrow: the lubrication engineer, for instance, knows that machines will be developed to move at greater speed, with heavier loads. He knows that problems of lubrication will become more difficult and more exacting. He knows, too, that Paramins will enable the oil compounder to meet the most stringent demands of tomorrow.

PARAMINS *Paraflow PDX Pour Point Depressant, Paratone Viscosity Index Improver, Paranox Range of Detergent Inhibitors, Paratac Stringiness Agent, Vistone B Oiliness Agent*

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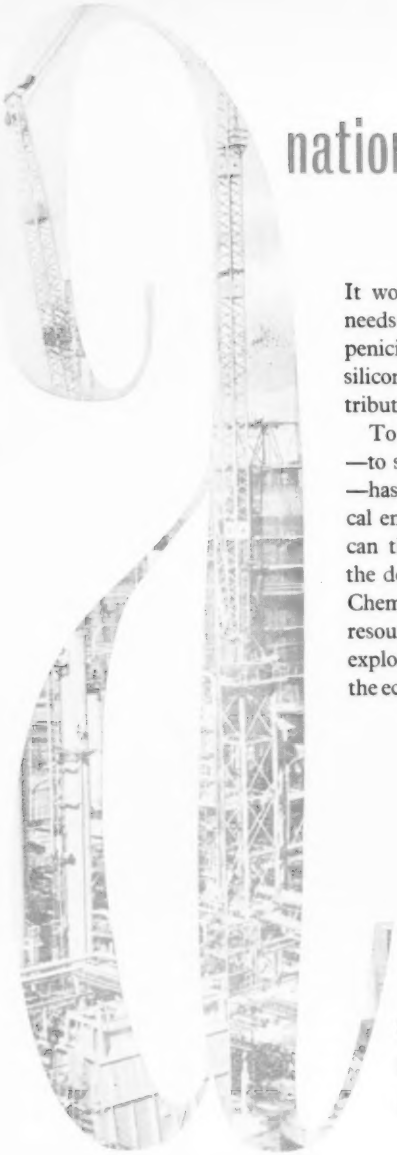

nation needs ideas...

It would be better to say that the world needs ideas. Ideas that work. Ideas like penicillin, the jet engine, terylene, the silicones, among more recent British contributions to world progress.

To contribute to the common endeavour —to share ideas, information and resources —has become a standard practice in chemical engineering. Only by concerted effort can the vast projects which are changing the destiny of mankind be carried through. Chemical engineering harnesses the world's resources anew, utilizes what was unusable, exploits what was unexploitable . . . answers the economic problems of a shrinking planet.

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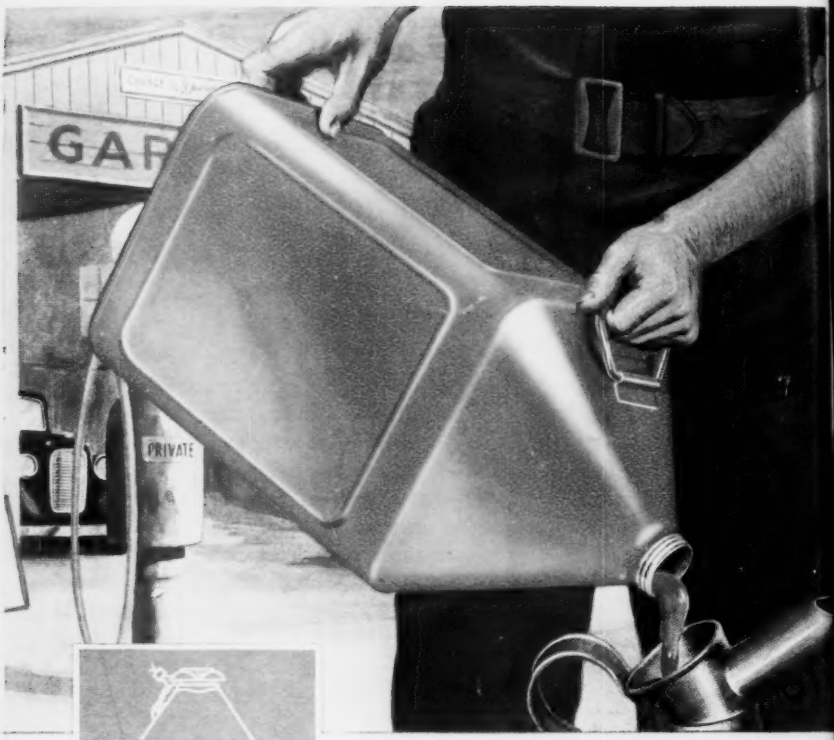

1¾" Screw cap, perforated on rim for wire sealing to lug on cone; drop handle located for ease of handling and pouring.

The SQUARE TAPER
—for easier handling

The Square Taper is designed for the easier handling of oils and similar liquids. Accurate pouring results from the tapered top which obviates in most cases the need for special adapters. The drop handle on the side of the cone facilitates control of the container when decanting; in addition, it reduces the risk of damage in transit and permits of easier access when lifting.

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